HARVARD UNIVERSITY.

LIBRARY

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY.

24.044.

GIFT OF

Leon J. Cole,

July 19, 1904.

M. O. C. BULL.
JUL 18 1904
Rec'd. Feb., '99.
24.044

Bulletin 54 June 1898

NEW HAMPSHIRE COLLEGE
AGRICULTURAL EXPERIMENT STATION

THE WINTER FOOD OF THE CHICKADEE

THE CHICKADEE OR BLACK-CAPPED TITMOUSE.

BY CLARENCE M. WEED

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM

NEW HAMPSHIRE COLLEGE

AGRICULTURAL EXPERIMENT STATION

DURHAM

BOARD OF CONTROL

HON. FRANK JONES, *Chairman*, Portsmouth.
HON. GEORGE A. WASON, New Boston.
CHARLES W. STONE, A. M., *Secretary*, Andover.
HON. JOHN G. TALLANT, Pembroke.
PRES. CHAS. S. MURKLAND, *ex-officio*, Durham.

THE STATION COUNCIL

PRES. CHAS. S. MURKLAND, A. M., Ph. D., *Acting Director*.
FRED W. MORSE, B. S., *Vice-Director and Chemist*.
FRANK WM. RANE, B. AGR., M. S., *Agriculturist and Horticulturist*
CHARLES H. PETTEE, A. M., C. E., *Meteorologist*.
HERBERT H. LAMSON, M. D., *Bacteriologist*.
CLARENCE M. WEED, D. SC., *Entomologist*.

ASSISTANTS

ELWIN H. FORRISTALL, B. S., *Superintendent of Farm*.
CHARLES D. HOWARD, B. S., *Assistant Chemist*.
ERNEST J. RIGGS, B. S., *Assistant Horticulturist*.
WILLIAM F. FISKE, *Assistant Entomologist*.
CLEMENT S. MORRIS, *Clerk*.

BULLETINS OF 1898

Bulletin 49—Inspection of Fertilizers. January.
Bulletin 50—Dehorning Cattle. February.
Bulletin 51—Sweet Corn in New Hampshire. March.
Bulletin 52—Growing Muskmelons in the North. April.
Bulletin 53—The Farm Water Supply. May.
Bulletin 54—The Winter Food of the Chickadee. June.

The Bulletins of this Station are sent free to any resident of New Hampshire upon application.

THE WINTER FOOD OF THE CHICKADEE

BY CLARENCE M. WEED

FIG. 1. Eggs of Apple Aphis.

Throughout New England, the Chickadee, or Black Capped Tit-mouse, *Parus atricapillus*, is one of the most abundant winter birds. It is commonly distributed over a wide area, in which it may be seen day after day, busily searching the twigs and branches of trees and shrubs. In order to determine more definitely the economic status of the species, the writer recently undertook a study of its winter food, the results of which are recorded in this bulletin. In the investigations I have been indebted to Mr. Ned Dearborn for many specimens, and have been aided in various ways by my assistant, Mr. W. F. Fiske. I am also under obligations to Dr. L. O. Howard of the U. S. Department of Agriculture, for the determination of some of the food elements.

The results as a whole show that more than half of the food of the chickadee during the winter months consists of insects, a very large proportion of these being taken in the form of eggs. About five per cent. of the stomach contents consisted of spiders or their eggs. Vegetation of various sorts made up a little less than a quarter of the food, two-thirds of which, however, consisted of buds and bud scales that were believed to have been accidentally introduced along with plant-lice eggs. These eggs made up more than one-fifth of the entire food, and formed the most remarkable element of the bill of fare. It seems to me evident that a large proportion of the bud scales are accidentally introduced into the stomachs of the birds, because most of the aphid eggs are taken from the crev-

ices beside the buds of deciduous trees and shrubs, and so it must commonly happen that bud scales are pecked away and swallowed with the eggs.

Fig. 2. Plant Lice Eggs on Twig of Birch (These eggs are eaten by Chickadees.)

This destruction of the myriad eggs of plant-lice which infest fruit, shade, and forest trees is probably the most important service which the chickadee renders during its winter residence. As indicated in the record below, more than 450 eggs sometimes occur as the food of one bird in a single day. On the supposition that one hundred were eaten daily by each of a flock of ten chickadees, there would be destroyed 1,000 a day, or 100,000 during the days of winter, a number which I believe to be far below the real condition, could we determine it precisely.

The most remarkable fact regarding the life history of plant-lice is their power of multiplication. Each egg hatches in spring into what is known as a viviparous female aphid, that is, a form which gives birth to living young by a process similar to the method of reproduction in some of the lowest animals, known as budding. This process begins about two weeks after hatching. each aphid giving birth to a large number of young, that in turn soon become mature and give birth to others. Consequently multiplication goes on in a constantly increasing geometrical ratio, that leads to the production of enormous numbers of the pests. Were it not for the numerous checks upon these insects found under natural conditions, they would overrun plants everywhere and render agriculture futile. In the window-garden and the greenhouse, where these checks are not always at work, the aphides often destroy plants unless some artificial remedy is employed against them. Even on crops out of doors the injury due to their presence is frequently great, and were it not for the destruction of their eggs by chickadees and other enemies, there can be no doubt that the damage would be vastly greater.

On those trees whose leaves drop off in autumn the eggs of plant-lice are commonly deposited in the crevices about the buds. The eggs of the common apple aphis are indicated as black specks about the buds in Fig. 1; those of an abundant species on birch are shown in Fig. 2; while Fig. 3 illustrates the eggs of a species that lays its eggs in great numbers upon the bark of willow branches. Although it is impossible to determine precisely the different species of plant-lice from their eggs, there was reason to believe that each of the species shown in these three figures had been eaten freely by the chickadees examined.

Fig. 3. Eggs of Plant-lice on Bark of Willow. (From a Photograph.)

Insect eggs of many other kinds were found in the food of the chickadees. Many of these it was impossible to recognize, but there was no difficulty in identifying the eggs of the common American Tent Caterpillar,[1] the egg mass of which is illustrated in Fig. 4, and of the Fall Canker Worm,[2] the eggs of which as found upon elm are represented in Fig. 5. There were also present the eggs and egg sacs of many spiders of kinds commonly occurring under loose bark (Fig. 6). While spiders as a class are doubtless beneficial creatures, the destruction of some of them is not in my opinion seriously detrimental to the usefulness of the chickadee.

The larvæ of several different kinds of moths were also found. One of the most abundant species was believed to be the common apple worm, the larva of the codling moth (Fig. 7). It was difficult to be sure of the species, because the heads of the larvæ were nearly always absent, but there is little doubt

[1] *Clisiocampa Americana.*
[2] *Anisopteryx pometaria.*

as to its identity. Another larva commonly found was one which winters over on the twigs in a small silken case, as shown in the light spots in Fig. 8. The bark beetles of the family *Scolytidæ*, which are destructive to forests all over our country, were also freely eaten by the chickadees. Some birds which had passed through the pine woods of the College farm were found to have eaten many of these beetles, the precise species being determined by Mr. E. A. Swarz of the United States Department of Agriculture, as *Pityogenes sparsus* Lec. So much of the time of these birds is spent in the woods that it is evident that they are of great benefit in destroying bark-beetles and other pests of forest trees.

Fig. 4. Egg-mass of American Tent Caterpillar. (These eggs are eaten by Chickadees.)

The hairy skins of the fruit of the common wild sumachs were among the most abundant elements of the vegetable food present. The edible portion of these fruits is evidently eaten to a considerable extent throughout the winter.

The Results in Detail

On the assumption that the scientific details of this study of the chickadee's food will not be of especial interest to the general reader, the following records are printed in smaller type, and may be passed over by any one who cares only for the general results.

But one specimen taken in November (the 12th) was studied. It had been killed after a tour through the tops of the pines in the College woods, and the stomach was chiefly filled with the fragments of small beetles belonging to the family of bark beetles *(Scolytidæ)*. These were estimated to form 85 per cent. of the entire contents. There were also five large eggs of an insect which were identified by

Dr. L. O. Howard as belonging to some species of the family *Reduviidæ*, making 2 per cent.; three small larvæ, apparently of the order Diptera, 1 per cent.; fragments of sumach berries, 2 per cent., and undetermined material, 10 per cent.

The next specimen was taken December 9th in an apple tree, it having previously been followed through a mixed growth of young pines, maple, willow, and birches. The stomach was nearly full of the eggs of aphides, 429 of these being counted in the mass; they were estimated to form 70 per cent. of the stomach contents. There were also present a small moth, 4 per cent.; a Carabid beetle, 5 per cent.; a snout beetle, 4 per cent.; two insect larvæ, 4 per cent.; an egg of the fall canker worm, 1 per cent.; feathers a trace, and undetermined material, 1 per cent.

Fig. 5. Eggs of Fall Canker Worm on Elm Twig. (Chickadees feed freely on these Eggs.)

The first specimens collected in January were taken on the 19th at 2 p. m., and consisted of four birds which had just passed through a young growth of grey birches, apple and maple trees growing in a neglected pasture. Three of these had eaten largely of vegetable matter which was doubtfully identified as the buds of some small plant; this material constituted 70 per cent. in two of the specimens and 75 per cent. in the third. The first bird had eaten in addition the following: Three insect larvæ, 1 per cent.; about 45 insect eggs, 5 per cent.; undetermined insects, 2 per cent.; small seeds, 6 per cent.; undetermined material, 8 per cent. The second specimen had a somewhat similar record, except that 6 per cent. of aphid eggs had been eaten. The third had eaten a large geometrid larva, forming 5 per cent of the food. The fourth chickadee of this lot had partaken of a somewhat different food from the other three. The principal item in its bill of fare consisted of material which was believed to be the skins of apples hanging from the trees, making 40 per cent. of the total food; plant-lice eggs formed 6 per cent.; eggs of fall canker worm, 4 per cent.; a lepidopterous larva, 10 per cent.; a large bud of a deciduous tree or shrub, 8 per cent.; small buds, 6 per cent.; and material not determined, 26 per cent.

Two chickadees were taken in Durham among some grey birches on the banks of the Oyster River at 10 A. M., February 14th. Both had

eaten largely of the small bud-like materials already noted, making 58 per cent. of the food in one and 37 per cent. in the other case. The other food elements of the first were aphid eggs, 24 per cent.; undetermined insects or their allies, 4 per cent., and undetermined material, 14 per cent. The stomach of the second specimen contained very little food, a caterpillar making 33 per cent., undetermined insects 8 per cent., grit 5 per cent., spiders 4 per cent., and undetermined material 13 per cent.

Fig. 6. Egg-sacs of Spiders on loose bark.

Four chickadees taken February 17th while feeding in a mixed growth of birch and pine had eaten chiefly aphid eggs, these constituting 62 per cent. of the entire food of the first specimen, 52 of the second, 46 of the third, and 61 of the fourth. In addition, one bird had eaten the eggs of the common American tent caterpillar to the extent of 16 per cent., and another had eaten a few specimens of a small flea beetle known to science as *Prasocuris varipes*. (Fig. 9.) The other food elements were certain small round bodies of unknown origin, eggs of insects, bud scales, and seeds of birch.

Another chickadee feeding in an apple tree February 17th had eaten 60 per cent. of the skins of sumach berries, 28 per cent. of aphid eggs, 3 per cent. of the eggs of bugs of the family *Reduviidæ*, and 2 per cent. of bud scales, while 7 per cent. was not determined. Still another killed on the same day in a clump of small pine trees had taken aphid eggs 19 per cent., bud scales 49 per cent., feathers 1 per cent., a spider, 2 per cent., and undetermined material 29 per cent.

Fig. 7. The Codling Moth.

Three chickadees were shot in an apple orchard February 19th, at 3:30 p. m. Their food was estimated as follows:

No. 1. Eggs of aphids, .05; cocoon and larvæ of codling moth (?), .15; spider eggs and egg sac, .28; undetermined insects, .11; undetermined vegetable matter, .18; undetermined animal matter, .22; grit, .01.

No. 2. Five codling moth larvæ (?) .67; cocoon of codling moth (?) .07; eggs of aphids, .12; small beetle *(Hoplocephala bicornis?)* .01; eggs of insect, .01; eggs of spiders, .01; spider, .02; buds, .05; undetermined material, .04; feathers, trace.

No. 3. Eggs of aphids, .52; lepidopterous larvæ, .28; two spiders and web, .10; bud scales, .03; undetermined, .07.

The next specimen was killed at 3 p. m. February 18th while picking at a small twig of a birch tree. It had evidently been eating the eggs of the plant-lice that are so abundant beside the buds of the birch, as 74 per cent. of the food consisted of aphid eggs, of which two sizes were present;—the smaller were probably those of the birch species. In addition there was a caterpillar, making 4 per cent.; small cocoons apparently of hymenopterous insects, 2 per cent.; bud scales, 9 per cent.; undetermined insects, 2 per cent.; and other material, 9 per cent.

Another chickadee taken at the same time in a similar situation contained 52 per cent. of aphid eggs and various other materials.

FIG. 8.—Winter cases of a small caterpillar beside apple buds. (They show as light spots.)

Two chickadees were taken at 4 p. m. February 26th at Durham Point in a mixed growth of pines and birches. One of these had eaten 454 eggs of aphides, making 44 per cent. of the food, and an equal percentage of material that seemed to be the dried castings from the old nests of tent caterpillars. In addition there were feathers, spiders' eggs, canker worm eggs, and woody matter, each estimated at 1 per cent., as well as 8 per cent. of undetermined material. The other bird contained the following: A good-sized fly, 11 per cent.; nine spiders—one large, one medium, seven small—24 per cent.; two spider egg-sacs, 10 per cent.; canker worm eggs, 2 per cent.; a measuring worm (*Geometridæ*), 22 per cent.; feathers, 1 per cent.; and undetermined material, 30 per cent.

FIG. 9—Flea beetle, magnified (Eaten by chickadee.)

Three chickadees were shot on March 4th at about 11:30 a. m. They belonged to a large flock which had been flying from tree to tree through the woods. The first had eaten 42 per cent. of aphid eggs, 18 per cent. of buds and bud scales, 9 per cent. spider and web, 2 per cent. of beetles, 6 per cent. of sumach fruits, 2 per cent. of oval brown insect eggs, and 21 per cent. was undetermined. The second specimen had eaten a large spider making 37 per cent. of the whole, and some spider's web making 7 per cent. more; leaf-hoppers of the family *Jassidæ*, 4 per cent.; eggs of fall canker worm, 4 per cent.;

a moth and pupa, 12 per cent.; the winter cases of a tineid, 3 per cent.; sumach berries 7, and undetermined material, 26 per cent. The third specimen was remarkable for the number of insect eggs which it had eaten. There were 121 good-sized eggs of aphides and 147 small eggs of aphides, the two together making 52 per cent. of the total food; in addition there were 20 reduviid eggs, making 9 per cent.; 15 round black and white eggs with a recticulate surface, 9 per cent.; and 15 oval, pointed, white eggs, making 5 per cent. Spiders and their cases made 6 per cent.; a lepidopterous larva, 3 per cent.; a beetle larva, 4 per cent.; a lepidopterous and hymenopterous cocoon, 1 per cent. each; five small larvæ, probably dipterous, 5 per cent.; bud scales, 1 per cent., and undetermined material, 4 per cent.

FIG. 10.—Nightflying moth (*Scopelosoma*). Eaten by chickadees

The next specimens studied were three birds taken at 1 p. m. March 4th, in small trees in a pasture. They had been feeding leisurely in trees or shrubs of birch, apple, alder, cedar, and barberry. Two of these had eaten many plant-lice eggs, and many other insects, while a third had eaten a variety of insects.

A chickadee taken about 2 p. m. March 4th in a small lot of pine in a pasture contained the following: Pupa of a lepidopterous insect, 11 per cent.; a lepidopterous larva, 16 per cent.; a spider, 10 per cent.; small hymenopterous cocoons, 24 per cent.; bud scales, 6 per cent.; sumach fruits, 8 per cent., and 25 per cent. was undetermined. About an hour later another bird was shot in a growth of hemlocks. "The circumstances," according to Mr. Fiske's notes, "were quite peculiar, the bird having flown to the ground and being in the act of picking at a piece of dead bark which had fallen from a tree. It was killed instantly, and when picked up had scarcely moved, except to open its wings a little. It had been picking at a nest of spiders' eggs, and the bill was still full of eggs, and in almost the precise position which the bird had assumed in the act of eating." The food record of this specimen was not, however, a very full one: In addition to the spider eggs the bird had swallowed there were aphid eggs 1 per cent.; bud scales, 32 per cent.; sumach fruits, 8 per cent., and 45 per cent. could not be determined.

About 4:30 p. m. March 4th, five chickadees were taken in an open pasture in which were many scattered trees. The birds were busily feeding, and had been noticed on apple, barberry, poplar, hemlock, elm, willow, birch, beech, and oak. The food contents are indicated in the following summaries:

No. 1. Pieces of sumach fruit, .46; eggs of aphides, .11; an insect larva, .21; spider's web, .08; eggs of insects, .04; feather, .01; undetermined arthropods, .04; undetermined material, .05.

No. 2. Stomach very full: aphid eggs, .23; spider eggs and egg-sac, .06; leaf-hopper (*Jassidæ*), .03: insect eggs, .05 (1 per cent. of them thought to be those of the forest tent caterpillar *Clisiocampa*

disstria); adult flies (Diptera), .06; puparia of flies, .09; lepidopterous pupæ, .05; insects undetermined, .27; seed of Polygonaceæ, .02; bud scales .01; undetermined material, .13.

No. 3. Stomach full. Eggs of aphides, .35; spider eggs and web, .22; larvæ, believed to be those of the codling moth, .12; other lepidopterous larvæ, .06; undetermined insects, .09; insect larvæ, .03; spider, .04; bud scales, .03; undetermined material. .06.

No. 4. Eggs of American tent caterpillar *(Clisiocampa Americana)*, .06; spider, .16; cocoon of spider, .11; aphid eggs, .04; eggs of fall canker worm, .02; beetles. .03; sumach fruits, .44; bud scales, .08; undetermined material, .06.

No. 5. A large noctuid larva, .44; insect eggs (Reduviidæ?), 19; aphid eggs, .06; insect larvæ, .08; sumach fruits, .07; bud scales, .06; undetermined material, .10.

The next specimen was taken March 11 at 10:30 a. m. in a growth of birch. It contained: aphid eggs, .24; geometrid larva, .12; beetles, .09; hymenopterous cocoons, .12; spiders and their web, .09; lichens, .05; bud scales, .11; and undetermined material, .18.

On March 26th a chickadee was shot at 8:30 a. m. It was one of a flock that was apparently emerging for the first time that day from a small grove thickly set with pine trees. There was very little food in the stomach, all of which appeared to be undigested material from the food of the day before. The only recognizable elements were bud scales, spider's silk and pieces of the legs of insects and spiders.

On March 26th, five chickadees were shot in a sugar orchard, and in apple trees near by. One of them had in its bill when killed the abdomen and part of the wings of the moth represented natural size in Fig. 10 and known to entomologists as *Scopelosoma indirecta*.

The food contents of these specimens were as follows:

No. 1.—Moth, .90 (*Scopelosoma*); eggs, probably from the abdomen of moth, .02; aphid eggs, .02; cocoon of spider, .03; undetermined, .03.

No. 2.—Moth, .27; beetles, .12; spiders, .14; small white egg of an insect, .01; small hymenopterous insect, .01; bark, .12; undetermined vegetable tissue, .26; feathers, .01; undetermined material, .06.

No. 3.—Noctuid moth, .61; bug (*Reduviidæ*), .03; spider, .16; web of spider, 04; undetermined arthropods, .12; undetermined vegetable matter, .04.

No. 4.—Three insect larvæ, probably lepidopterous, .28; small beetles, .05; bark-lice (*Coccidæ*), apparently oyster-shell bark-louse (*Mytilaspis pomorum*), .01; aphid eggs, .01; spider, .06; bud scales, .23; bark, .14; undetermined vegetable matter, .22.

No. 5.—Two lepidopterous larvæ, .38; lepidopterous pupa, .32; dipterous larvæ .14; undetermined adult arthropods, .08; lichen, .01; bud scales, .02; undetermined vegetable matter, .03; feather, .02.

The last specimens of the winter were taken by Mr. Dearborn at 11.00 a. m. on March 29th. They were feeding near the ends of high branches of a large chestnut tree at Northfield, Merrimack Co., New Hampshire. Apparently comparatively little food had been taken that morning, the stomach of the first specimen containing 44 per cent. of bud scales, probably largely left over from the day before, and 30 per

cent. of undetermined vegetable matter. In addition there were 9 per cent. of aphid eggs, an equal ratio of adult insects, and 8 per cent. of insect larvæ. The second had eaten even less that morning, there being only a few skins of aphid eggs, and the rest of the material consisting of bud scales and undetermined vegetable matter.

TABLE I.—FOOD OF THE CHICKADEE.

Months.	Nov.		Dec.		Jan.		Feb.		March.		Summary.	
No. of specimens each.	1		1		4		15		20			
Kinds of Food.	No. of spec.	Per cent. of whole.	No. of spec.	Per cent. of whole.	No. of spec.	Per cent. of whole.	No. of spec.	Per cent. of whole.	No. of spec.	Per cent. of whole.	No. of spec.	Per cent. of whole.
Arthropoda (undetermined)	....	....	....	....	....	....	1	....	3	.01	4	.005
Insecta "	....	....	....	....	2	.03	5	.02	5	.03	12	.03
Insect eggs "	....	....	....	....	1	....	3	.01	7	.02	11	.015
Insect larvæ "	....	....	1	.04	....	....	....	....	6	.04	7	.02
Coleoptera "	....	....	....	....	....	....	1	.01	7	.04	8	.02
Scolytidæ	1	.85	....	....	....	....	....	....	....	....	1	.02
Carabidæ	....	....	1	.05	1	....	....	....	....	....	2	
Tenebrionidæ	....	....	....	....	....	....	1	....	....	....	1	
Chrysomelidæ	....	....	....	....	....	....	1	....	....	....	1	
Curculionidæ	....	....	1	.04	1	.01	....	....	....	....	2	
Larvæ	....	....	....	....	1	....	1	....	3	.03	5	.02
Lepidoptera (undeterm'd)	....	....	1	.04	1	.01	....	....	4	.10	6	.06
Eggs "	....	....	....	....	1	....	3	.01	1	...	5	
Anisopteryx pometaria	....	....	1	.01	2	.03	2	.01	2	.01	7	.015
Clisiocampa	....	....	....	....	....	....	1	.01	2	.01	3	.01
Larvæ (undetermined)	1	.01	....	....	2	.03	4	.06	8	.06	15	.065
Carpocapsa pomonella?	....	....	....	....	....	....	2	.06	1	.01	3	.025
Pupæ (undetermined)	....	....	....	....	1	....	1	....	6	.02	8	.01
Diptera	....	....	....	....	1	....	1	.01	2	.01	4	.01
Larvæ	....	....	....	....	1	....	....	....	4	.02	5	.01
Puparia	....	....	....	....	....	....	....	....	1	.01	1	.005
Hemiptera (undetermi'd)	....	....	....	....	....	....	....	....	1	....	1	
Jassidæ	....	....	....	....	....	....	....	....	2	.01	2	.005
Coccidæ	....	....	....	....	....	....	....	....	1	....	1	
Eggs (Reduviidæ)	1	.02	....	....	....	....	4	.01	2	.01	7	.01
(Aphididæ)	....	....	1	.70	3	.05	13	.35	14	12	31	.21
Hymenoptera	....	....	....	....	....	....	....	....	1	....	1	
Cocoons	....	....	....	....	1	....	1	....	3	.02	4	.01
Spiders	....	....	....	....	....	....	5	.03	11	.06	16	.04
Eggs	....	....	....	....	....	....	4	.03	4	.03	8	.025
Vegetable matter (undetermined)	....	....	....	....	....	....	1	....	5	.04	6	.02
Buds and bud scales	....	....	....	....	4	.56	9	.10	15	.10	28	.14
Sumach fruit	1	.02	....	....	....	....	4	.05	7	.07	12	.04
Seeds	....	....	....	....	2	.03	3	.01	1	....	6	.01
Lichens	....	....	....	....	....	....	....	....	2	....	2	
Insect excrement (?)	....	....	....	....	1	.01	5	.09	...	....	6	.03
Spiders' silk	....	....	....	....	....	....	2	.01	9	.02	11	.01
Undetermined	1	.10	1	.11	4	.24	15	.12	20	.10	41	.11
Summary.												
Insecta	....	87	....	88	....	16	....	56	....	58	....	57.5
Arachnida	....	...	....	....	....	....	....	6	....	9	....	.065
Vegetable matter	....	.02	...	...	....	.59	....	.16	....	.21	....	.21
Extraneous "	....	.01	....	.01	....	.09	....	.09	....	.02	....	.04
Undetermined matter	....	.10	....	.11	....	.24	...	.12	....	.10	....	.11

ABUNDANCE AND FEEDING HABITS

In order to get some idea of the abundance of chickadees in a region like south-eastern New Hampshire, where a considerable portion of the land is wooded, I requested Mr. Fiske to spend a day in the woods and fields, recording the number of flocks of chickadees seen, the approximate size of each flock, and observing their feeding habits. He has summarized his observations in the following paragraphs:

"In the course of the day, a distance of about seven miles was traversed, without taking into account the many minor deviations in the route; four square miles would seem a reasonable estimate of the area covered. Eleven flocks of chickadees were seen, varying in numbers from four to forty, but averaging about thirteen in each flock. Estimating the amount of territory covered at four square miles, this would place the number of birds for each square mile at thirty-five, which certainly seems a reasonable estimate.

"During the forenoon, the birds were not very busy feeding, and all the flocks encountered were traveling through the woods at a rate somewhat faster than was pleasant to follow on foot, each bird stopping for an instant at any especially tempting tree or dead stub, and then hastening on to join its companions. In the afternoon, especially toward evening, the birds encountered seemed to be attending much more closely to feeding. Instead of traveling across country, the flock would scatter over a section of woodland or pasture, each bird searching closely the crevices in trees, stumps, and fences. A peculiar habit which I had not before noticed is worthy of mention: when one of the chickadees wished to investigate some crevice or bunch of lichen where it could not obtain a foothold, it would hover before it a moment in the air, as a hummingbird hovers before a flower.

"These remarks apply to a day in early March, which, while not sunny, was still fairly warm and quiet. During the darker days of January and February, when the snow lies deep and the wind is often cold and sharp, the daily life of the chickadee is quite different. Several trips into the field for material for study were made in February, and the birds

were then confined more closely to the evergreen woods and other situations equally sheltered, seldom venturing out into open pastures and fields. In the College woods, which are largely composed of tall pines, there was almost always a flock to be found by very little searching, flying from tree to tree far up in the tops, and scrutinizing closely each mossy limb, or alighting on the terminal twigs and picking something out of the leaf clusters. They did not confine themselves to the tall growth by any means, but, in a little clump of trees, very similar to that represented in Figure 11, there was a colony to be found at almost any time during the latter half of February."

ENCOURAGING THE PRESENCE OF CHICKADEES

Fortunately, these useful birds are easily induced to remain upon the premises, where their services, in destroying the insect enemies of orchards, vineyards, and other plantations, will abundantly repay the slight trouble necessary to lead them into a condition of semi-domestication. It has been repeatedly observed by bird lovers in many parts of the Northern states that the chickadees are common in city parks, and about premises in which there are evergreens in which they may find shelter during the storms of winter. Numbers of observers have found that by placing bones with a little meat attached to them in a tree, the chickadees and other winter birds are attracted to it, while in one instance the birds became so tame that they would alight on the person who was studying their habits. Mr. Fiske has had abundant opportunity to study this phase of the subject upon his father's farm in Webster, New Hampshire, and furnishes the following summary of his observations:

"Chickadees may readily be taught to come around the house, if fed regularly, and a flock of them thus partially tamed may be the source of much amusement to one having a liking for birds. They are fond of almost any food of an animal nature, especially if it contain more or less fat; they will also eat farinaceous food to a certain extent, being quite partial to bits of brown bread. If supplied with a surplus of food in the shape of small fragments, they will, after eating all that

they can, carry away large quantities and tuck it away in crevices in the bark, or at the base of twigs, in some neighboring tree. If the wood-pile is handy, it affords numerous opportunities for this purpose, and is freely used. This habit of stor-

FIG. 11. A Refuge for Birds.

ing food is of great benefit to the blue jays, who, if the food is displayed on a window-shelf, or some similar situation, dare not get it for themselves, but will hang around until it is stored away by the chickadees, when they will steal the morsels from their hiding places."

The protection which a pine grove affords to chickadees and other winter birds is one reason why it is desirable to have such a bit of woodland on or near the farm. It also serves as a shelter to many other birds during the summer season.

A remarkable example of the benefit that may be derived from the presence of a flock of chickadees, has been recorded by Mr. E. H. Forbush, in a bulletin of the Massachusetts State Board of Agriculture. In a certain orchard in Massachusetts, canker-worms had been abundant the previous season, and the moths of the fall canker-worm had deposited great numbers of eggs upon the trees. Pieces of meat, bone, or suet were fastened to the trees early in the winter, to attract the chickadees.

The birds came, and remained about the orchard nearly all winter. They were carefully watched, it being found that they were feeding on the eggs of the canker-worm moth. A few birds were killed, to determine the number of eggs eaten. Between 200 and 300 canker-worm eggs were found in the stomach of each of these birds. In the spring, the female moths of the spring canker-worm were also devoured by these birds. The result was that the chickadees, assisted in spring and early summer by various other birds, saved the orchard from any serious injury by the canker-worms.

CONCLUSION

The investigations recorded in this Bulletin, show that the chickadee is one of the best of the farmer's friends, working throughout the winter to subdue the insect enemies of the farm, orchard, and garden. For the efficient service thus rendered the bird asks no pay, although it may be induced to remain more of the time upon the farm premises, if bones or suet are hung in trees where the birds may get it during winter.

A